APPENDIX F

PLANT COMMUNITIES MAPPED ON FORT BELVOIR PRIOR TO THE DEVELOPMENT OF THE NATURE CONSERVANCY'S NATIONAL VEGETATION SYSTEM

Plant Communities Mapped on Fort Belvoir Prior to the Development of the Nature Conservancy's National Vegetation System.

Oak/Ericad (Heath Family) Forests

Oak/ericad forests are upland forests of gravelly ridges and dry slopes, generally located at the tops of hills and bluffs and along steep, well-drained slopes. The overstory is dominated by chestnut oak (*Quercus prinus*), with a mixture of northern red oak (*Quercus rubra*), white oak (*Quercus alba*), and scarlet oak (*Quercus coccinea*). At Fort Belvoir, vegetation in the understory varies between two topographically different types. Arid plateaus are generally composed of chestnut oak and white oak with huckleberry (*Gaylussacia baccata*) and deerberry (*Vaccinium stamineum*) in the understory. Cooler, northerly-facing steep slopes are dominated by chestnut oak, and the understory generally consists of mountain laurel (*Kalmia latifolia*) (Paciulli, Simmons and Associates, Ltd., 1998).

Beech Mixed Oak Forests

At Fort Belvoir, beech mixed oak forests are generally located on the more gradual slopes, topographically below oak/ericad forests. Mixed oak species of white oak and northern red oak are dominant trees with American beech (*Fagus grandifolia*) dominant as shrubs in the understory. Other common shrubs in the understory consist of flowering dogwood (*Cornus florida*), red maple (*Acer rubrum*), and cherryleaf viburnum (*Viburnum prunifolium*). Occasional areas of mature American beech are found in lower, moister elevations or within ravines (Paciulli, Simmons and Associates, Ltd., 1998).

Tulip Poplar Mixed Hardwood Forest

Tulip poplar mixed hardwood forests are upland forests of moist fertile ravine slopes and ravine bottoms. At Fort Belvoir, they are found in habitats similar to beech mixed oak forest, but are more common on more gradual slopes and ravine bottoms. Tulip poplar (*Liriodendron tulipifera*) trees are dominant within this vegetation community type, but American beech, white oak, and northern red oak are also mixed. Understory species are similar to that of beech mixed oak forests and consist of flowering dogwood, American beech, and red maple shrubs (Paciulli, Simmons and Associates, Ltd., 1998).

A tulip popular mixed hardwood forest community just west of the mouth of Accotink Creek, within the Accotink Bay Wildlife Refuge, has been identified as a significant community of its type due to its age and extent. This community type is common in Virginia; however, mature examples are rare (Hobson, 1996).

Seep Forests

Seep forests are often open-canopy forests of groundwater-saturated flats and slopes, generally surrounded by mixed hardwood forests. They occur along slopes where groundwater flows to the surface. Characteristic species are red maple, black gum (*Nyssa sylvatica*), sweetbay magnolia (*Magnolia virginiana*), skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), and royal fern (*Osmunda regalis*). Key indicators are large mats of skunk cabbage and other herbaceous wetland vegetation. Although not a dominant forest type, seep forests are of special interest at Fort Belvoir, because they provide unique wetland habitats within the dominant upland forests (Paciulli, Simmons and Associates, Ltd., 1998).

Three acid seep swamps on Fort Belvoir have been identified as significant vegetation communities. One

of these is adjacent to the fresh tidal marsh at the mouth of Accotink Creek, another lies at the foot of upland slopes in Training Areas T-9 and T-7, and the third is located on HEC in the Dogue Creek watershed. These seeps provide habitat on Fort Belvoir for the state rare sphagnum sprite (*Nehalennia gracilis*) and a state rare sedge (*Carex vestita*). They also provide habitat for several watchlist species (species ranked by DCR-NHP as S3 – "rare to uncommon," or SU – "status uncertain") including the gray petaltail (*Tachopteryx thoreyi*), aurora damsel (*Chromagrion conditum*), and eastern red damsel (*Amphiagrion saucium*). The watchlist dragonfly species, *Gomphaeschna furcillata,* has also been recorded in this habitat on Fort Belvoir (Hobson, 1996).

Mixed Pine Hardwood Forests

Mixed pine hardwood forests consist of transitional forests between early successional pine and climax hardwood types. Vegetation is a variable mix of pines, oaks, and other hardwoods. At Fort Belvoir, mixed pine hardwood forests were identified where hardwoods and pine trees appeared to be evenly distributed or where neither hardwoods nor pines appeared to be more than 70% dominant. Virginia pine is the dominant pine in mixed pine hardwood forests, although some stands mixed with loblolly pine exist. Dominant hardwoods in mixed pine hardwood forests are variable, but can be generalized based on topography and their position bordering mapped hardwoods. For example, mixed pine hardwood forests mapped at the tops of dry ridges and bordered by oak/ericad forest are likely to have chestnut oak or scarlet oak as the dominant hardwood in the mix. Lowland areas tend to have tulip poplar and red maple mixed with Virginia pine. Upland areas tend to be mixed with white oak and chestnut oak (Paciulli, Simmons and Associates, Ltd., 1998).

Virginia Pine Forests

Virginia pine forests consist of early successional forest of old fields or other land clearings dominated by Virginia pine (greater than 70% dominance). Virginia pines are most abundant and occur naturally compared to forests of loblolly pine and white pine, which most likely have been introduced by plantings in former clearings (Paciulli, Simmons and Associates, Ltd., 1998).

Loblolly Pine Forest

Small portions of the installation have been planted in loblolly pine. The loblolly pine forests at Fort Belvoir are usually planted and often appear in rows. Native stands are not prevalent at Fort Belvoir (Paciulli, Simmons and Associates, Ltd., 1998).

White Pine Forest

One stand of planted white pine large enough for mapping occurs at the Elhers Road entrance to Davison Army Airfield. White pine is also used throughout Fort Belvoir for landscaping; however, these areas were not included because they are located within improved grounds (Paciulli, Simmons and Associates, Ltd., 1998).

Moderately Well-Drained Floodplain Hardwood Forests

Moderately well-drained floodplain hardwood forests are dominant within the major floodplains. They are palustrine forests of moderately well-drained to somewhat poorly-drained floodplain bottomland. These hardwood forests are generally located above streambanks in non-hydric soils that are mixed with

upland and wetland vegetation. They are flooded regularly, but the well-drained soils do not retain hydrology long enough to support wetland vegetation. At Fort Belvoir, moderately well-drained floodplain hardwood forests are dominated by tulip poplar mixed with red maple and sweet gum (*Liquidambar styraciflua*) trees. The understory consists of ironwood (*Carpinus caroliniana*), red maple, and spicebush (*Lindera benzoin*) shrubs. In both the moderately well-drained floodplain hardwood forests and tulip poplar mixed hardwood forests, the tulip poplar is the dominant indicator species. However, the composition of other characteristic species is significantly different. Characteristic species of moderately well-drained floodplain hardwood forests are adapted to moister soils within the floodplain (Paciulli, Simmons and Associates, Ltd., 1998).

Poorly Drained Floodplain Hardwood Forest

The poorly drained floodplain hardwood forest type is a palustrine forest occurring on somewhat poorly-drained to very poorly-drained floodplain bottomlands and sloughs. Its composition is variable, and it is generally located on hydric soils (soils that are inundated or saturated for a significant amount of time so that anaerobic conditions are created) dominated by hydrophytic vegetation (plants typically found in wetland habitats). They are most extensive along Pohick Creek and Accotink Creek floodplains and consist of a variable mix of pin oak (*Quercus palustris*), willow oak (*Quercus phellos*), green ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*), red maple, river birch (*Betula nigra*), and sweet gum. The understory contains highbush blueberry (*Vaccinium corymbosum*) (Paciulli, Simmons and Associates, Ltd., 1998).

Poorly drained hardwood forests differ from moderately well-drained hardwood forests in that they are located on wetter soils and are dominated by hydrophytic vegetation. Moderately well-drained floodplain hardwood forests are located within drier soils and are mixed with hydrophytic and non-hydrophytic vegetation. Poorly drained floodplain hardwood forests are usually jurisdictional wetlands under Section 404 of the Clean Water Act.

Non-Tidal Marsh/Beaver Pond Community

Non-tidal marsh/beaver pond areas are successional herbaceous to scrubby wetlands of variable composition. They consist of emergent wetlands that are above the tidal limits of Accotink Creek and Pohick Creek, and emergent wetlands within Jackson Miles Abbott Wetland Refuge along Dogue Creek. Large areas of emergent wetlands border the braided channels within Pohick Creek's floodplain and above the tidal influence. Many of these areas are created or influenced by beaver activity that has caused flooding and created open marshes in areas previously dominated by hardwood forests. Beavers have created a large marsh along Poe Road. Vegetation composition is variable, consisting of emergents including arrow arum (*Peltandra virginica*), rice cutgrass (*Leersia oryzoides*), sedges (*Carex* sp.), rushes (*Juncus* sp.), smartweeds (*Polygonum* sp.), and swamp rose mallow (*Hibiscus moscheutos*). Common shrubs are buttonbush (*Cephalanthus occidentalis*), swamp rose (*Rosa palustris*), and swamp dogwood (*Cornus amomum*) (Paciulli, Simmons and Associates, Ltd. 1998). The beaver pond complexes at Fort Belvoir support two state-rare damselfly species: the sphagnum sprite and the furtive forktail (*Ischnura prognata*). The state rare least bittern (*Ixobrychus exilis*) has been known to use marshes in the Dogue Creek wetlands (Hobson, 1996).

Tidal Marsh Community

Tidal marshes dominate shallow tidal areas of Accotink and Pohick Creeks, and also occur at the mouths of several streams that flow from Fort Belvoir into surrounding tidal waters. Tidal marsh consists of a

variable mix of emergent wetland vegetation such as arrow arum, yellow pond lily (*Nuphar luteum*), pickerelweed (*Pontedaria cordata*), wild rice (*Zizania aquatica*), cattail (*Typha latifolia*), and river bulrush (*Scirpus fluviatilis*) (Paciulli, Simmons and Associates, Ltd., 1998).

The fresh tidal marsh at the mouth of Accotink Creek is an area of semipermanently flooded herbaceous vegetation, which has been identified as a significant community. It represents a community type that is fairly uncommon in Virginia. This community is in good to excellent condition with little evidence of disturbance and is one of the better examples of its type in Virginia. Several rare plant species, including vetchling (*Lathyrus palustris*), water-plantain spearwort (*Ranunculus ambigens*), and river bulrush (*Scirpus fluviatilis*) occur within this community at the head of Accotink Bay. The watchlist plant species large bur-reed (*Sparganium eurycarpum*) and creeping spikerush (*Eleocharis smallii*) also occur within this community (Hobson, 1996).

Freshwater Tidal Swamp Forest Community

Freshwater tidal swamp forests are tidally influenced palustrine forests. At Fort Belvoir, the dominant trees are green ash and red maple. The understory composition is variable, and influenced by the extent of tidal flooding and openness of the canopy. Typical shrubs in less inundated areas include highbush blueberry, arrowwood viburnum, and silky dogwood (*Cornus amomum*) in areas less inundated. Areas that have an open canopy and are semi-permanently to permanently flooded have an understory that includes typical broadleaf emergents such as arrow arum, yellow pond lily (*Nuphar luteum*), and pickerelweed that occupy adjacent tidal marshes (Paciulli, Simmons and Associates, Ltd., 1998).

Two significant areas of tidal swamp forest occur as peninsulas that extend into Gunston Cove. Tidal forests are also located along the upper tidal limits of Accotink Bay.

Tidal Scrub/Shrub Wetland Community

Tidal scrub/shrub wetlands at Fort Belvoir are the least dominant tidal vegetation community and are generally located along the edges of tidal swamp forests near the transition to tidal marsh. They are tidally influenced palustrine scrub/shrub wetlands dominated by woody plants less than three inches in diameter at breast height, but greater than 3.2 feet in height. Tidal scrub/shrub vegetation at Fort Belvoir consists of black willow (*Salix nigra*), red maple, common alder (*Alnus serrulata*), and green ash (Paciulli, Simmons and Associates, Ltd., 1998).

Old Field Grasslands

In the Mid-Atlantic region, old field grasslands generally are abandoned fields and clearings that are still in early successional stages. At Fort Belvoir, they generally consist of unimproved open fields or areas that are infrequently mowed. Old field grasslands occur in areas previously cleared for landfills, farming, and training. Approximately 190 acres of grasslands and potential grasslands have been identified at Fort Belvoir. They range in size from less than one-half acre to more than 20 acres (Paciulli, Simmons and Associates, Ltd., 1996). Old field grasslands do not include grounds such as golf course roughs since they tend to be landscaped and mowed occasionally. Dominant vegetation consists of a variable mix of grasses and wildflowers (forbs). Characteristic species are broomsedge (*Andropogon virginicus*), tall fescue (*Festuca elatior*), and bushclover (*Lespedeza cunneata*). These areas are valuable for providing habitat for song birds, ground nesting birds, and small mammals, which provide food sources for wildlife such as fox and birds of-prey (Paciulli, Simmons and Associates, Ltd., 1998).

Urban Land

All developed areas at Fort Belvoir are identified as urban land. Urban land consists of improved and semi-improved grounds. This includes open lands, natural tree stands and woodland borders, buildings and paved areas, turf and landscaped areas. Open areas such as the airfield and golf courses are considered urban land. The vegetation is characterized by a wide variety of native trees, planted landscape trees and shrubs, tall fescue grass, and Kentucky bluegrass (*Festuca arundinacea*) (Paciulli, Simmons and Associates, Ltd., 1998). Vegetation management of developed lands is presented in the following chapter 10.0 Developed Areas.

APPENDIX G

ECOLOGICAL COMMUNITY TYPES
OF
FORT BELVOIR

Ecological Community Types of Fort Belvoir

Flatwoods Mesic Forest
Mesic Mixed Hardwood Forest
Dry-Mesic Oak-Hickory Forest
Mixed-Oak / Ericad Forest
Chestnut Oak / Ericad Forest
Alluvial Mixed Hardwood Forest: Poorly-Drained Type
Alluvial Mixed Hardwood Forest: Well-Drained Type
Coastal Plain / Piedmont Acidic Seepage Swamp
Bottomland Hardwood Swamp
Tidal Hardwood Swamp
Tidal Shrub Swamp
Beaver Marsh: Rush – Sedge Type
Beaver Marsh – Arrow-arum Type
Tidal Freshwater Marsh: Mixed Type
Marsh: Mud Flat Type
Tidal Freshwater Marsh: Wild Rice – Smartweed Type
Tidal Freshwater Marsh: Spikerush – Golden-club Type

Flatwoods Mesic Forest

Description

The Flatwoods Mesic Forest canopy is somewhat open (60-80% cover) and composed of tall (>20m) *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (yellow poplar). Other trees that can occur in the canopy are *Liquidambar styraciflua* (sweetgum), *Platanus occidentalis* (sycamore), and mesophytic *Quercus* spp. such as *Q. rubra*, *Q. shumardii*, *Q. alba*, and *Q. phellos* (red, Shumard, white, and willow oaks). *Fagus grandifolia* and *Carpinus caroliniana* (American hornbeam) are the most common species in the open to sparse understory (5-40% cover). The shrub layer is open with typically less than 5% cover. The species that occur in the open layer are *Ilex opaca* var. *opaca* (American holly) and young *Fagus grandifolia*, *Carpinus caroliniana*, *Liquidambar styraciflua*, and *Quercus* spp. saplings. This community type can be found on flats along wetlands, so an occasional wetland shrub (e.g., *Rhododendron viscosum* [swamp azalea], *Lyonia ligustrina* [maleberry]) or herb may be a component at the community edge.

The herb layer is sparse in this type (0-5% cover). Woody seedlings of *Acer rubrum* (red maple), *Amelanchier arborea* (downy serviceberry), *Carpinus caroliniana*, *Fagus grandifolia*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Nyssa sylvatica* (black gum), *Quercus phellos*, and *Viburnum dentatum* (southern arrow-wood) account for a majority of the species found in the lowest layer. True herbs include *Carex swanii* (swan sedge), *Epifagus virginiana* (beechdrops), and *Parthenocissus quinquefolia* (Virginia creeper).

The vegetational character of the community type is relatively consistent throughout the growing season due to the dominance of woody saplings, seedlings, and persistent herbs. The mean species richness of this type is 32.

Threats or disturbances

Microstegium vimineum (eulalia) was present in one of the representative plots. *Microstegium vimineum* is an invasive exotic annual grass that forms dense monospecific stands and tends to exclude native herbaceous vegetation. Further habitat disturbance included trash washed up into the habitat during high water.

Mesic Mixed Hardwood Forest

Description

The Mesic Mixed Hardwood Forest is characterized by high cover of *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (yellow poplar) in the tall (>20m), somewhat open to dense (70-100% cover) canopy. Other hardwoods in the mixed canopy include *Quercus alba*, *Q. pagoda*, *Q. rubra*, *Q. velutina*, and *Q. montana* (white, cherrybark, northern red, black, and chestnut oaks), *Carya alba* and *C. cordiformis* (mockernut and bitternut hickories), *Fraxinus americana* (white ash), and *Platanus occidentalis* (sycamore). The understory (trees in the 6-20m) is usually sparse (<25% cover) and can include *Fagus grandifolia*, *Cornus florida* (flowering dogwood), *Carpinus caroliniana* (American hornbeam), *Liriodendron tulipifera*, *Nyssa sylvatica* (black gum), *Acer rubrum* (red maple), *Carya alba*, *Amelanchier arborea* (downy serviceberry), *Prunus serotina* var. *serotina* (wild black cherry), and *Fraxinus americana*.

The vegetational character of the shrub layer is variable, although the cover is consistently sparse (<25% cover). *Asimina triloba* (pawpaw) can can high cover in both the shrub and herb layers, but is not uniformly present throughout the type. *Asimina triloba* is a rhizomatous plant that forms dense thickets and therefore, when present, can be a large component of the shrub layer. Other shrubs and woody vines of the community type are *Lindera benzoin* (spicebush), *Amelanchier arborea*, *Vitis aestivalis* var. *aestivalis* (summer grape), *Ilex opaca* var. *opaca* (American holly), and *Parthenocissus quinquefolia* (Virginia creeper). Young trees of the understory are also present in the shrub layer.

The herb layer of this community ranges from sparse when *Asimina triloba* is present (5-25% cover), to very sparse (0-5% cover). Typical plants of the herb layer are *Botrychium virginianum* (rattlesnake fern), *Euonymus americanus* (American strawberry-bush), *Maianthemum racemosum* ssp. *racemosum* (false solomon's seal), *Lonicera japonica* (honeysuckle), *Toxicodendron radicans* (poison ivy), and *Parthenocissus quinquefolia*. Woody seedlings account for a third to half of the species recorded in the herb layer based on data recorded from five representative vegetation samples.

The vegetative character of this type is relatively consistent throughout the growing season. Mean species richness is 32.

Threats or disturbances

Evidence of disturbance includes *Lymantria dispar* (gypsy moth) damage, *Discula destructiva* (dogwood anthracnose), exotic plants, and trash.

Dry-Mesic Oak-Hickory Forest

Description

The Dry-Mesic Oak-Hickory forest has a 60-100% closed canopy >20 m tall. The dominant species are mixed and variable, and can include *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus coccinea* (scarlet oak), *Quercus montana* (chestnut oak), *Carya alba* (mockernut hickory), *Carya glabra* (pignut hickory), *Liquidambar styraciflua* (sweet gum), *Liriodendron tulipifera* (yellow poplar), and *Fagus grandifolia* (American beech). The presence of *Carya alba* or *Carya glabra* with *Quercus* spp. in the overstory is truly diagnostic of this type. Trees present in the canopy are also present in the understory. *Nyssa sylvatica* (black gum) is an additional species common to the 10-20 m layer. The lowest tree layer (6-10 m) is sparse (0-25% cover) and typically composed of several species. *Cornus florida* (flowering dogwood), *Toxicodendron radicans* (poison ivy), *Carpinus caroliniana* (eastern hornbeam), and *Ilex opaca* var. *opaca* (American holly), as well as many of the canopy species, are found in the understory.

The shrub stratum is very sparse to sparse (0-25% cover) in most stands of this type. If either *Kalmia latifolia* (mountain laurel) or *Asimina triloba* (pawpaw) is present in this forest type, shrub cover can be significant. *Asimina triloba* and *Kalmia latifolia* are rhizomatous shrubs that form dense thickets and therefore, when present, can contribute high cover to the shrub stratum. *Chionanthus virginicus* (fringetree), *Corylus americana* (American hazelnut), *Prunus serotina* var. *serotina* (wild black cherry), *Vaccinium corymbosum* (highbush blueberry), *Amelanchier arborea* (downy serviceberry), *Sassafras albidum* (sassafras), and *Celtis occidentalis* (common hackberry) were all documented in the shrub stratum of this type.

The very sparse herb layer (<25% cover) consists primarily of woody seedlings from the overstory. *Vaccinium pallidum* (early lowbush blueberry) is nearly constant in the herb layer, but achieves <1% mean cover. Other typical taxa of the herb layer are *Euonymus americanus* (American strawberry-bush), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax glauca* (whiteleaf greenbrier), *Smilax rotundifolia* (common greenbrier), and *Toxicodendron radicans*. Community structure is consistent during the growing season and mean species richness is 36.

Threats or disturbances

Evidence of disturbance includes *Lymantria dispar* (gypsy moth) damage, *Discula destructiva* (dogwood anthracnose), exotic plants (*Lonicera japonica* [honeysuckle] and *Celastrus orbiculatus* [oriental bittersweet]), and trash.

Mixed-Oak / Ericad Forest

Description

Quercus alba (white oak) and *Quercus montana* (chestnut oak) are the dominant canopy trees in the Mixed Oak / Ericad Forest type. Other oaks variably found in the community type are *Quercus rubra* (northern red oak) and *Quercus falcata* (southern red oak). Cover of the canopy (>20 m tall) is open to dense (40-80%). The understory (6-20 m) of *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Nyssa sylvatica* (black gum), *Quercus montana*, and *Quercus alba* is sparse (5-25% cover). The shrub layer is also sparse and can include *Ilex opaca* var. *opaca* (American holly), *Kalmia latifolia* (mountain laurel), and young trees.

The presence of *Gaylussacia baccata* (black huckleberry), *Vaccinium stamineum* (deerberry), and/or *Vaccinium pallidum* (early lowbush blueberry) characterizes the sparse herb layer. These species belong to the *Ericaceae* (heath) family, a family of acidophilic, typically shrubby plants. Where canopy gaps have formed, from tree death or storm damage, these ericads occur with greater cover. Other species of the thin poor soils are *Epifagus virginiana* (beechdrops), *Chimaphila maculata* (spotted wintergreen), *Danthonia spicata* (povery oat-grass), *Euonymus americanus* (American strawberry-bush), and *Viburnum acerifolium* (maple-leaf viburnum). This stratum is sparse and species poor, with a mean species richness of 15. Based on three plot samples, woody saplings account for as much as two-thirds of the herb layer species.

The character of this community type is quite consistent throughout the growing season. Overall mean species richness is 18.

Threats or disturbances

Lymantria dispar (gypsy moth) damage was noted in this community type. The habitat has also been severely altered in some areas by training practices and logging.

Chestnut Oak / Ericad Forest

Description

The nearly closed canopy of this Chestnut Oak / Ericad Forest type is dominated by *Quercus montana* (chestnut oak). This species has a mean cover of 50-75% in the community type and is largely dominant in the >20 m class. Other species present in the uppermost stratum are *Acer rubrum* (red maple) and *Quercus velutina* (black oak). The 10-20 m layer is variable in density, ranging from 5-60% cover based on four plot samples. The most consistent species of this stratum is *Fagus grandifolia* (American beech). Other contributing species include *Acer rubrum*, *Quercus montana*, *Quercus coccinea* (scarlet oak), *Quercus velutina*, and *Liquidambar styraciflua* (sweetgum). The lowest layer of the understory (6-10 m) is very sparse to open. *Sassafras albidum* (sassafras) is characteristic of this stratum and occurs in all four of the sampled plots.

Shrub cover is typically high (60-80%) due to the prevalence of *Kalmia latifolia* (mountain laurel). This species is part of the *Ericaceae*, a family of acidophyllic, typically shrubby plants. It forms thickets and therefore can attain high cover when it is present. Other shrubs occuring at low cover within the *Kalmia latifolia* thicket are *Ilex opaca* var. *opaca* (American holly), *Viburnum acerifolium* (maple-leaf viburnum), *Hamamelis virginiana* (witchhazel), and *Asimina triloba* (pawpaw).

The dense shade of *Kalmia latifolia*, together with the thin, acidic soils of this type, precludes a significant herb layer. *Chimaphila maculata* (spotted wintergreen), *Epifagus virginiana* (beechdrops), *Epigea repens* (trailing arbutus), *Mitchella repens* (partridge-berry), *Vaccinium pallidum* (early lowbush blueberry), *Medeola virginiana* (Indian cucumber-root), *Smilax rotundifolia* (common greenbrier), and *Polystichum acrostichoides* (Christmas fern) are a few of the species that do occur in the herb layer. Woody seedlings account for a significant number (53%-100%) of the species recorded in the herb layer. No species recorded, however, had a mean cover >1%.

This oak / ericad forest type is floristically uniform throughout the growing season because of its predominantly woody herb layer. Mean species richness for this type is 19.

Threats or disturbances

Lymantria dispar (gypsy moth) herbivory was noted in three of the four plots. The impact of the large *Odocoileus virginianus* (white tailed deer) population at Fort Belvoir was indicated by browse lines in two plots. Soil erosion was also recorded in two plots.

Alluvial Mixed Hardwood Forest: Poorly Drained Type

Description

The canopy (>20m) of this poorly drained Alluvial Mixed Hardwood Forest consists of water tolerant tree species such as *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (yellow poplar), *Quercus palustris* (pin oak), *Ulmus americana* (American elm), and *Quercus phellos* (willow oak). The understory (10-20 m) is sparse to open (0-60% cover). *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa sylvatica* (black gum), and robust vines of *Toxicodendron radicans* (poison ivy) are found in this stratum. The 6-10 m stratum is sparse (0-25% cover) and composed of smaller trees of the higher strata. *Carpinus caroliniana* (eastern hornbeam) is another associate in the understory.

The shrub layer of this type is sparse (0-25% cover). True shrubs include *Juniperus virginiana* (eastern red cedar), *Ilex verticillata* (winterberry), *Vaccinium fuscatum* (hairy highbush blueberry), and *Lindera benzoin* (spicebush).

Cover of the herb layer in sampled plots is sparse to open (0-40%), but can be relatively high in species richness. Although not all are true herbs, forty-eight species were recorded for the herb layer in two plots. *Aster lateriflorus* (calico aster), *Athyrium filix-femina* var. *asplenioides* (lady fern), *Boehmeria cylindrica* (false nettle), *Campsis radicans* (trumpet vine), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (common greenbrier), and *Lycopus virginicus* (Virginia bugleweed) occur frequently in this stratum.

The community type has pronounced, temporal differences in hydrology produced by seasonal flooding, but the vegetational character does not deviate significantly. Mean species richness for the type is 39.

Threats or disturbances

Opportunities for the flood transport of seeds and plant materials have encouraged many exotic species. *Lonicera japonica* (honeysuckle), *Berberis thunbergii* (barberry), *Rosa multiflora* (multiflora rose), *Stellaria media* (chickweed), and *Celastrus orbiculatus* (bittersweet) were documented in plots of this type, but their contributions to cover were insignificant. The alien grass *Microstegium vimineum* (eulalia), however, was significant in this type. *Microstegium vimineum* is an invasive exotic annual grass that forms dense monospecific stands and tends to exclude native herbaceous vegetation.

The true character of this community type at Fort Belvoir is questionable. Hydrology on the base has been significantly altered for training and drainage purposes. Ditching and other alterations have occurred adjacent to several of the plot sites and undoubtably have influenced these stands. It is difficult to clearly identify the impact of these changes.

Alluvial Mixed Hardwood Forest: Well-Drained Type

Description

This community type consistently has tall (>20 m) *Liquidambar styraciflua* (sweetgum) and *Liriodendron tulipifera* (yellow poplar) in the canopy. Less abundant associates are *Acer rubrum* (red maple), *Quercus pagoda* (cherrybark oak), and *Quercus palustris* (pin oak). A sizable *Carya cordiformis* (bitternut hickory); (70 cm DBH) was in one plot and contributed significant cover. Mean canopy cover across all plots was somewhat open to dense (60-100% cover). One plot documented a young, early succession forest with a canopy <20 m tall. Understory layers (6-10 m and 10-20 m) include young trees of the overstory, as well as *Carpinus caroliniana* (eastern hornbeam), *Nyssa sylvatica* (black gum), and abundant young *Fagus grandifolia* (American beech). Woody vines of *Toxicodendron radicans* (poison ivy) and *Vitis vulpina* (winter grape) contribute cover in these strata.

The shrubs *Lindera benzoin* (spicebush), *Asimina triloba* (pawpaw), *Sassafras albidum* (sassafras), *Corylus americana* (American hazelnut), and *Ilex opaca* var. *opaca* (American holly) can occur in the sparse to very open shrub stratum (5-40% cover). Sapling trees of the overstory and understory are also common in this stratum.

Microstegium vimineum (eulalia), an exotic grass, has severly impacted much of this habitat at Fort Belvoir and typically forms dense (80%-100%) cover in the herb layer. Cover of native species is very sparse or sparse (0-25%). *Lindera benzoin*, which is characteristic in the shrub layer, also achieves one of the highest covers in the herb layer. Other native species that consistently characterize the herb layer are *Cinna arundinacea* (wood reedgrass), *Galium circaezans* (southern forest bedstraw), *Geum canandense* (white avens), *Polystichum acrostichoides* (Christmas fern), and *Smilax rotundifolia* (common greenbrier).

Some ephemeral species may have been excluded from documentation of this community type, because all samples were completed later in the growing season. Many early flowering species flourish in mesic habitats and could be present before *Microstegium vimineum* begins its growth. Consequently, the herb stratum experiences seasonal differences in cover and composition. Mean community type species richness is 43.

Threats or disturbances

Liriodendron tulipifera and *Liquidambar styraciflua* are shade intolerant species that successfully colonize after disturbance (e.g. logging). Their presence in large stands, as recorded in this type, can indicate a forest in early successional development.

Of all the community types at Fort Belvoir, this type is most visibly disturbed and degraded by exotic species, specifically *Microstegium vimineum*.

Coastal Plain / Piedmont Acidic Seepage Swamp

Description

The Coastal Plain / Piedmont Acidic Seepage Swamp community supports a mix of wetland and upland plants under an open forest canopy. The canopy (>20 m) typically includes *Acer rubrum* (red maple) and *Liriodendron tulipifera* (yellow poplar). Overstory cover is sparse to somewhat open (5-60%). Canopy trees in one sample do not reach 20 m, but have 60-80% cover in the 10-20 m class. The understory layers can include *Nyssa sylvatica* (black gum), *Fagus grandifolia* (American beech), *Carpinus caroliniana* (eastern hornbeam), large *Magnolia virginiana* (sweetbay magnolia), and small trees of the overstory species. Two of the seepages sampled near Accotink Bay have *Fraxinus pennsylvanica* (green ash) in the 6-10 m stratum. This tree is common in the tidal hardwood swamp and bottomland hardwood swamps that occur along Accotink Bay. Seepage habitat near other wetlands will often share hydrophytic species because of similar soil conditions.

Shrub cover is minimal (0%-5%) to moderately dense (60-80%). *Magnolia virginiana* is the most diagnostic species of this startum. *Chionanthus virginicus* (fringetree), *Ilex verticillata* (winterberry), *Leucothoe racemosa* (fetterbush), *Lindera benzoin* (spicebush), *Rhododendron viscosum* (swamp azalea), *Toxicodendron vernix* (poison sumac), *Viburnum nudum* (possum-haw), *Lyonia ligustrina* (maleberry), and *Vaccinium corymbosum* (highbush blueberry) are also found in the shrub layer. *Magnolia virginiana*, *Lindera benzoin*, *Rhododendron viscosum*, and *Vaccinium corymbosum* each have >25% cover in at least one sample.

The herb layer of this seepage type is characterized by plants of saturated, acidic soils. Herbaceous cover is typically high (80-100%) and relatively diverse. Mean species richness of the herb layer from the six plot samples is 35. This number does include woody seedlings, but they are not the significant components of this stratum as in upland types. Common seepage plants that contribute high cover to this type are *Symplocarpus foetidus* (skunk cabbage) and *Osmunda cinnamomea* (cinnamon fern). *Arisaema triphyllum* (jack-in-the-pulpit), *Boehmeria cylindrica* (false nettle), *Carex laevivaginata* (smooth-sheath sedge), *Cinna arundinacea* (wood reedgrass), *Impatiens capensis* (spotted jewelweed), *Lycopus virginicus* (Virginia bugleweed), *Mitchella repens* (partridge-berry), and *Smilax rotundifolia* (common greenbrier) were all constant in the plots sampled.

Once *Symplocarpus foetidus* dies back in early summer, other hydrophytic species dominate the community type. This transition of herbaceous species can produce large changes in species composition and structure during the growing season. Mean community type species richness is 42.

Threats or disturbances

Beaver impoundments are encroaching on the seepage wetlands found in training area T-9. A few exotics are present in this community type, but do not severely impact the habitat.

Bottomland Hardwood Swamp

Description

This Bottomland Hardwood Swamp community type is easily recognized by its nearly monospecific canopy of *Fraxinus pennsylvanica* (green ash). The canopy is open to somewhat open (40-80% cover) and the majority of cover occurs at ca. 20 m. Other trees that can be present in the overstory are *Betula nigra* (river birch), *Acer rubrum* (red maple), *Platanus occidentalis* (sycamore), and *Salix nigra* (black willow). The understory (6 m–20 m) is sparse to very sparse (0-25% cover). *Acer negundo* (box elder), *Acer rubrum*, young *Fraxinus pennsylvanica*, *Betula nigra*, and *Ulmus americana* (American elm) are components of varying importance. The woody vines *Toxicodendron radicans* (poison ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis vulpina* (winter grape) reach into the upper understory.

The shrub layer is very sparse. *Ilex verticillata* (winterberry) is a common shrub that occurs in these low, wet flood plains. Other shrubs found in this habiatat are *Acer negundo*, *Diospyros virginiana* (persimmon), young *Liquidambar styraciflua* (sweetgum), young *Fraxinus pennsylvanica*, *Alnus serrulata* (smooth alder), *Viburnum dentatum* (southern arrow-wood), and *Lindera benzoin* (spicebush). The woody vines *Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Lonicera japonica* (honeysuckle), and *Vitis labrusca* (fox grape) also occur in the shrub layer.

The high species richness of this type (mean =51) is largely attributable to the herb layer. This layer of the Bottomland Hardwood Swamp is extremely dense and stratified. *Saururus cernuus* (lizard's tail) and *Poa trivialis* (rough bluegrass) have the highest covers for most of the growing season. Many other herbaceous species occur in this habitat and often have low cover (<1%). *Amphicarpaea bracteata* (hog peanut), *Aster lateriflorus* (calico aster), *Boehmeria cylindrica* (false nettle), *Cinna arundinacea* (wood reedgrass), *Circaea lutetiana* ssp. *canadensis* (enchanter's nightshade), *Commelina virginica* (Virginia dayflower), *Cryptotaenia canadensis* (honewort), *Dichanthelium clandestinum* (deer-tongue panic grass), *Galium aparine* (cleavers), *Geum canandense* (white avens), *Glyceria striata* var. *striata* (fowl mannagrass), and *Impatiens capensis* (spotted touch-me-not) are consistently found in this habitat, though in very low numbers.

The vegetational character of this forest differs throughout the growing season. In early to mid spring, graminoid vegetation covers the forest floor. Mats of *Lysimachia nummularia* (moneywort) are particularly notable in the spring before the grasses and other herbs attain full size. By mid-summer, *Saururus cernuus* and other dicotyledons increase greatly in cover.

Threats or disturbances

The presence of this community type on a flood plain greatly influences the character of the habitat. Moving bodies of water easily disperse seed, so the creeks promote the introduction of non-native species. The exotics *Lysimachia nummularia*, *Lonicera japonica*, *Microstegium vimineum* (eulalia), *Alliaria petiolata* (garlic mustard), *Artemesia vulgaris* var. *vulgaris* (mugwort), *Festuca pratenses* (meadow fescue), *Glechoma hederacea* (ground ivy), *Ligustrum obtusifolium* (border privet), and *Stellaria media* (common chickweed) were all recorded within this community type. *Poa trivialis*, one of the nominal herbs of this type, is also an exotic plant.

Tidal Hardwood Swamp

Description

This Tidal Hardwood Swamp Forest has a sparse to open canopy (5-40% cover) that reaches a maximum height of about 20 m. The canopy dominant is *Fraxinus pennsylvanica* (green ash), with *Liriodendron tulipifera* (yellow poplar), *Nyssa sylvatica* (black gum), and *Fraxinus profunda* (pumpkin ash) as minor associates. The understory is very sparse to sparse (0-10% cover) and relatively low in diversity. The understory species include *Acer rubrum* (red maple), *Magnolia virginiana* (sweetbay magnolia), *Fraxinus profunda*, and *Fraxinus pennsylvanica*.

The shrub layer is very sparse to very open (0-40% cover). The common shrub species include *Alnus serrulata* (smooth alder), *Ilex verticillata* (winterberry), *Leucothoe racemosa* (fetterbush), *Lindera benzoin* (spicebush), *Vaccinium corymbosum* (highbush blueberry), *Viburnum prunifolium* (smooth black-haw), *Viburnum dentatum* (southern arrow-wood), and *Cornus amomum* (silky dogwood). The vines *Toxicodendron radicans* (poison ivy), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (common greenbrier), and *Lonicera japonica* (honeysuckle) also reach this stratum.

The herb layer is dense (80-100% cover). *Polygonum punctatum* (dotted smartweed) and *Saururus cernuus* (lizard's tail) contribute the greatest herbaceous cover. *Peltandra virginica* (arrow-arum) is another diagnostic species of this type, occurring in all plots, with a mean cover of 2-5%. Additional constant species of the herb layer are *Boehmeria cylindrica* (false nettle), *Carex crinita* (long hair sedge), *Carex lurida* (sallow sedge), *Carex tribuloides* (blunt broom sedge), *Cinna arundinacea* (wood reedgrass), *Dioscorea quaternata* (whorled wild yam), *Galium tinctorium* (stiff marsh bedstraw), *Geum canandense* (white avens), *Glyceria striata* var. *striata* (fowl mannagrass), *Lycopus virginicus* (Virginia bugleweed), *Mikania scandens* (climbing hempweed), and *Polygonum arifolium* (halberd-leaf tearthumb). The dense herb layer persists throughout the growing season. Species richness for this community type is 47.

Threats or disturbances

The exotic forb *Murdannia keisak* (marsh dewflower) is abundant in the community type. This species becomes established in freshwater wetlands and forms a solid mat of vegetation that crowds out native species. The oriental mystery snail (*Cipangopaludina chinensis*) is seemingly ubiquitous in the tidal swamps and marshes at Fort Belvoir. These snails can negatively alter the vegetational habitat and have been identified as intermediate hosts for parasitic organisms that can affect human health.

Tidal Shrub Swamp

Description

This is a characteristic, shrubby community occurring near the upper reaches of tidal influence. *Alnus serrulata* (smooth alder) and *Salix nigra* (black willow) are the most constant and abundant shrub species in this dense stratum (40-80% cover). *Cornus amomum* (silky dogwood), *Viburnum dentatum* (southern arrow-wood), *Lindera benzoin* (spicebush), *Ilex verticillata* (winterberry), *Rosa palustris* (marsh rose), and *Corylus americana* (American hazelnut) are also common in the shrub layer. Isolated small trees <10 m tall (e.g. *Fraxinus pennsylvanica* [green ash], *Platanus occidentalis* [sycamore], and *Salix nigra*) can be present in this community. The average height of the shrub layer is ca. 2 m.

The herb layer is typically dense (80-100% cover) and rich with forbs. Two herbs that also frequently reach shrub height are *Apios americana* (American groundnut) and *Mikania scandens* (climbing hempweed). *Boehmeria cylindrica* (false nettle), *Carex crinita* (long hair sedge), *Cinna arundinacea* (wood reedgrass), *Geum canandense* (white avens), *Impatiens capensis* (spotted jewelweed), *Pilea fontana* (blackfruit clearweed), *Polygonum arifolium* (halberd-leaf tearthumb), and *Polygonum punctatum* (dotted smartweed) are other common herbs. *Pilea fontana* was chosen as the nominal herb because of its high diagnostic value for this community type.

This shrub swamp is compositionally consistent throughout the growing season, but the relative covers of species change as they each achieve their maximal size. Community type mean species richness is 44.

Threats or disturbances

Exotic plants were noted in the plots of this community type. *Lonicera japonica* (honeysuckle) and *Microstegium vimineum* (eulalia) were present in most (80%) samples. *Murdannia keisak* (marsh dewflower) has a high mean cover (5-10%) for this type.

Beaver Marsh: Rush – Sedge Type

Description

A very sparse tree cover (typically 10 m tall) characterizes the Sedge – Rush Beaver Marsh community type. The few water-tolerant woody species that occur in this open layer are *Acer rubrum* (red maple), *Liriodendron tulipifera* (yellow poplar), and *Quercus phellos* (willow oak). The shrub stratum has a cover of 5-40% and is well developed with a mix of wetland shrubs. These include *Leucothoe racemosa* (fetterbush), *Rhododendron viscosum* (swamp azalea), *Vaccinium corymbosum* (highbush blueberry), and *Viburnum nudum* (possum-haw).

The herb layer is dense and stratified with graminoids, woody saplings, and forbs. The diagnostic species soft rush, *Carex lurida* (sallow sedge), and *Carex stricta* (tussock sedge) contribute the greatest cover among samples of this community type. Other commonly occurring herbs include *Boehmeria cylindrica* (false nettle), *Galium tinctorium* (stiff marsh bedstraw), *Juncus acuminatus* (sharp-fruited rush), *Mikania scandens* (climbing hempweed), *Osmunda cinnamomea* (cinnamon fern), *Sparganium americanum* (American burreed), *Symplocarpus foetidus* (skunk cabbage), *Utricularia biflora* (two-flower baldderwort), and *Woodwardia areolata* (netted chain fern).

The relative covers of species in this type are seasonably variable, but composition is quite stable during the growing season. Mean species richness for the two plots is 41.

Threats or disturbances

The exotics *Microstegium vimineum* (eulalia) and *Lonicera japonica* (honeysuckle) are the only invasive species recorded in the two samples of this community type. They do not currently pose a serious threat to the habitat. Beaver activity continually alters local hydrology and could potentially increase or decrease the range of the nontidal wetland communities.

Beaver Marsh – Arrow-arum Type

Description

This beaver marsh type can have considerable floristic variation. Canopy cover is very sparse to absent (0-5%) and *Acer rubrum* (red maple) was the sole canopy tree species recorded in this type. The shrub layer is also very sparse or absent. When present, shrubs can include *Acer negundo* (box elder), *Leucothoe racemosa* (fetterbush), and young *Acer rubrum*. The herb stratum is dense. One or a few species contribute most of the cover, but the dominant species can vary within the community type. Characteristic high-cover herbs are *Peltandra virginica* (arrow-arum), *Saururus cernuus* (lizard's tail), and *Leersia oryzoides* (rice cutgrass). While a few species attain high cover, many additional herbs occur in low numbers, including *Alisma subcordatum* (broad-leaved water plantain), *Scutellaria lateriflora* (mad dog skullcap), *Triadenum walteri* (Walter's St. John's wort), *Carex lurida* (sallow sedge), and *Lycopus virginicus* (Virginia bugleweed).

The dominant vegetation is fairly persistent throughout the growing season. *Leersia oryzoides*, however, increases in cover and dominance as the season progresses. Mean species richness for the three plots of this community type is 31.

Threats or disturbances

Two exotic species, *Microstegium vimineum* (eulalia) and *Iris pseudacorus* (yellow flag), were documented in this community type but do not currently compromise the habitat quality.

Tidal Freshwater Marsh: Mixed Type

Description

The Tidal Freshwater Marsh: Mixed Type is characterized by high species richness and lack of clear dominance by one or a few species. The physiognomy is considered herbaceous although some low woody species (e.g. *Salix caroliniana* [Carolina willow]) can be present and the herbs can be rather tall. The mixed marsh vegetation often reaches heights of 1.5 m. Vegetation cover is essentially 100% and layered. Species that occur in all five examples of this community type (constancy=100%) include *Apios americana* (American groundnut), *Boehmeria cylindrica* (false nettle), *Carex comosa* (bristly sedge), *Hibiscus moscheutos* ssp. *moscheutos* (eastern rose-mallow), *Polygonum arifolium* (halberd-leaf tearthumb), *Scirpus fluviatilis* (river bulrush), and *Typha latifolia* (broad-leaved cattail). The nominal species (*Typha latifolia*, *Scirpus fluviatilis*, *Carex comosa*) are highly indicative of the community type. *Carex tribuloides* (blunt broom sedge), *Lycopus americanus* (American bugleweed), *Mikania scandens* (climbing hempweed), *Peltandra virginica* (arrow-arum), *Polygonum sagittatum* (arrow-leaved tearthumb), and *Pontedaria cordata* (pickerelweed) are common associates in these marshes. Many other herbs are present in low numbers. The mean species richness for this type is 35, with a range of 23 to 41.

Threats or disturbances

Many exotic plants were recorded from plots of this type. The most invasive species is *Murdannia keisak* (marsh dewflower), which forms a solid mat of vegetation that crowds out native species. Other exotic taxa recorded were *Arthraxon hispidus* (joint-head arthraxon), *Hydrilla verticillata* (hydrilla), and *Microstegium vimineum* (eulalia).

Tidal Freshwater Marsh: Mud Flat Type

Description

The Tidal Freshwater Marsh: Mud Flat Type has an entirely herbaceous physiognomy with dense cover (80-100%) of mostly leafy forbs. *Nuphar advena* (spatterdock) and *Peltandra virginica* (arrow-arum) are the characteristic and dominant species. *Nuphar advena* is rhizomatous and can therefore occur in nearly monospecific stands. *Peltandra virginica* produces a pedunculate fruit that hangs down into the mud and decays, releasing the seeds in the immediate substrate. Because of this reproductive strategy, *Peltandra virginica* is also found in large populations. Both of these wetland plants are large-leaved, and produce substantial cover. The floating/submergent exotic *Hydrilla verticillata* (hydrilla) also has very high cover, sometimes forming solid mats under the emergent forbs. Species with significant mean cover in thi stype are *Pontedaria cordata* (pickerelweed) (2-5%), *Scirpus fluviatilis* (river bulrush) (1-2%), and *Zizania aquatica* (wild rice) (1-2%). *Cinna arundinacea* (wood reedgrass), *Ludwigia palustris* (marsh seedbox), *Mikania scandens* (climbing hempweed), *Mimulus alatus* (winged monkey-flower), *Murdannia keisak* (marsh dewflower), *Sagittaria latifolia* (broad-leaf arrowhead), and *Typha latifolia* (broad-leaved cattail) occur in small numbers and collectively account for less than 2% of the total cover in a given plot. The species richness of this type is very low, with as few as three species in a 100 m^2 plot. The mean species richness for this type is seven.

Threats or disturbances

The exotic, floating/submergent aquatic plant *Hydrilla verticillata* can have high cover in the mud flat community type. This rhizomatous plant aggressively crowds out native vegetation and forms large mats that prevent light from reaching native aquatic species. It also provides increased habitat for mosquitos and clogs waterways for navigation. This noxious weed has had a profound impact on the Potomac River and its tributaries. It will continue to compromise the integrity of the Pohick Bay and Accontink Bay marshes. Another exotic, *Murdannia keisak*, was documented in one plot of this type. This exotic species forms a solid mat of vegetation that outcompetes native species.

The oriental mystery snail (*Cipangopaludina chinensis*) is seemingly ubiquitous in the marshes at Fort Belvoir. These snails can negatively alter the vegetational habitat and have been identified as intermediate hosts for parasitic organisms that can affect human health.

Tidal Freshwater Marsh: Wild Rice – Smartweed Type

Description

The robust annual *Zizania aquatica* (wild rice) is the dominant and characteristic species of this community type, with a 75-100% late-season cover. *Polygonum punctatum* (dotted smartweed) is found in fairly dense cover (10-25%) under the tall stems of *Zizania aquatica*. Other species present are *Sagittaria latifolia* (broadleaf arrowhead), *Cyperus erythrorhizos* (red-root flatsedge), *Orontium aquaticum* (golden club), and *Peltandra virginica* (arrow-arum). Species richness is low (14 species) in the one sampled plot, which is typical of the wild rice tidal marsh.

Threats or disturbances

The floating/submergent *Hydrilla verticillata* (hydrilla) is an abundant part of this community type. This rhizomatous plant aggressively crowds out native vegetation and forms large mats that prevent light from reaching native aquatic species. It also provides increased habitat for mosquitos and clogs waterways for navigation. This noxious weed has had a profound impact on the Potomac River and its tributaries. It will continue to compromise the integrity of the Pohick Bay and Accontink Bay marshes. The other two exotics noted, *Lysimachia nummularia* (moneywort) and *Microstegium vimineum* (eulalia), are not as prevalent as *Hydrilla verticillata*.

Tidal Freshwater Marsh: Spikerush – Golden-club Type

Description

This community is a distinctive marsh type that occurs in relatively small patches within mixed marsh vegetation. *Eleocharis palustris* (creeping spikerush), a rhizomatous perennial, is locally dominant and creates small, relatively monospecific areas in the marsh vegetation. *Orontium aquaticum* (golden club) has a moderately high cover (5-10%) in the one sampled plot and was consistently present in other patches of this type that were observed. Minor associates are *Peltandra virginica* (arrow-arum), *Polygonum punctatum* (dotted smartweed) and *Polygonum sagittatum* (arrow-leaved tearthumb), *Scirpus tabermontani* and *S. cyperinus* (soft-stem and woolgrass bulrush), *Asclepias incarnata* (swamp milkweed), *Bidens connata* (purple-stem swamp beggar-ticks), *Leersia oryzoides* (rice cutgrass), and *Sparganium eurycarpum* (giant burreed). Other marsh species from the surrounding mixed marsh could be expected in this type. More plot samples are needed to produce a more robust classification and description of this provisional type. Species richness of the representative plot is 14

Threats or disturbances

The exotic forb *Murdannia keisak* (marsh dewflower) was documented in this type. This species forms a solid mat of vegetation that crowds out native species. Additionally, the oriental mystery snail (*Cipangopaludina chinensis*) is present in this marsh type at Fort Belvoir. These snails can negatively alter the vegetational habitat and have been identified as intermediate hosts for parasitic organisms that can affect human health.